OLSR Algorithm Presentation

The algorithm that will change the world

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Outline of the Presentation

Agenda

The problem

Routing Problem in MANETs

The challenge is to create a routing protocol for mobile ad-hoc networks (MANETs) that adapts in real-time to their constantly changing network topologies, ensuring reliable communication with minimal overhead. Traditional static routing protocols are ineffective in this dynamic environment, which is where the OLSR algorithm comes into play, aiming to resolve these issues.

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Motivation/Importance

Essential Connectivity: OLSR addresses the critical need for stable communication in dynamic environments like disaster recovery, military operations, and remote connectivity.
Real-world Reflection: The protocol models our social dynamics, where each node supports and relies on the network, highlighting our interconnected nature.
Broad Applications: From emergency services to smart vehicles, OLSR's efficiency is crucial for the next generation of wireless communication.
Complex Balance: Crafting a protocol that is both adaptive and lightweight in a constantly shifting network topology is a complex yet vital task.

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Definition of the Problem

The routing problem in MANETs that OLSR aims to solve involves determining the most efficient paths for data transmission between mobile nodes in a network where links frequently and unpredictably appear and disappear as nodes move.

Background

- **DSR (1996, Johnson & Maltz):** On-demand routing; higher latency compared to OLSR's constant updates.
- **AODV (1999, Perkins & Royer):** Reactive like DSR; uses routing tables, unlike OLSR's MPRs.
- **DSDV (1994, Perkins & Bhagwat):** Proactive with full-table broadcasts; OLSR reduces overhead with selective flooding.
- **TORA (1997, Park & Corson):** Adapts quickly to changes with link reversal; OLSR maintains consistent network topology knowledge.

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Contributions

- **Proactive Routing:** OLSR provides constant route availability, which is crucial for applications requiring immediate route access.
- **MultiPoint Relays (MPRs):** Reduces the overhead of message flooding by using selected nodes to forward control messages.
- **Optimized Routing Control:** The protocol minimizes control traffic through incremental topology updates rather than full-fledged table exchanges.
- **Topology Dissemination:** OLSR's efficient dissemination of topology information ensures all nodes maintain consistent network knowledge.
- **Scalability:** Designed to scale well in larger networks compared to many other MANET routing protocols.

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OLSR Algorithm Overview

The Optimized Link State Routing (OLSR) algorithm involves the following key procedures:

- **Topology Discovery:** Nodes periodically exchange ”hello” messages to detect neighbors and assess link status.
- **MPR Selection:** Each node selects a set of neighboring nodes as MultiPoint Relays (MPRs) based on the network topology to efficiently forward messages.
- **Routing Table Calculation:** Nodes use topology information, primarily through MPRs, to calculate the shortest paths to all other nodes in the network.
- **Control Message Flooding:** MPRs disseminate Topology Control (TC) messages across the network, reducing the number of transmissions required to share topology changes.
- **Route Maintenance:** Nodes continuously monitor link status and adapt the network routing tables accordingly, ensuring up-to-date path availability.

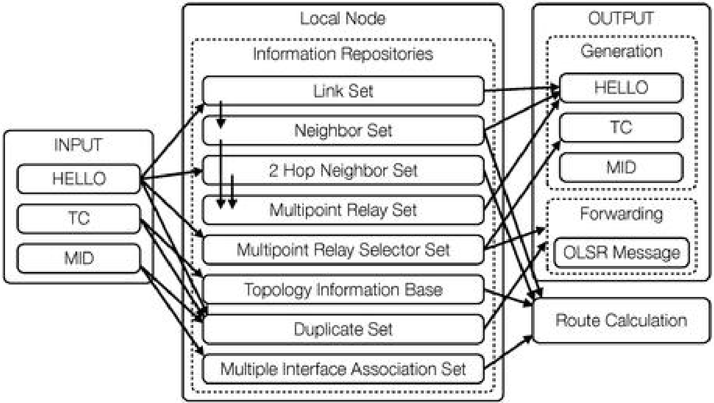

Figure: OLSR Algorithm Workflow [1]

OLSR Algorithm Pseudocode

```
Initialize: for each node do
    Set HelloInterval, TCInterval;
    Initialize Neighbor Table, Topology Table, Routing Table;
end
MainLoop: while network is operational do
    Every HelloInterval: BroadcastHelloMessage to neighbors;
    Every TCInterval: BroadcastTCMessage to MPRs;
    On receiving a message: Update tables and RecalculateRoutingTable();
    MaintainMPRSet based on Neighbor Table;
end
Procedure UpdateTables
    Message
if Hello message then
    update Neighbor Table;
else if TC message then
    update Topology Table;
end
Procedure RecalculateRoutingTable
    Compute shortest path using Topology Table;
Procedure MaintainMPRSet
    Select minimal set of neighbors covering all two-hop neighbors;
```

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Experimental Results

This will be created as the project progresses.

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Conclusions

This will be created as the project progresses.

References

[1] Wikipedia, "Optimized link state routing protocol," 2022, accessed: 2022-02-22. [Online]. Available: https://en.wikipedia.org/wiki/Optimized_Link_State_Routing_Protocol

Questions

THANK YOU

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